

Notes for Remarks

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Introduction

Good afternoon and thank you for inviting me.

Dave Butters and the APPRO team asked that I use my time to update you on and share insights around the Darlington Refurbishment Project.

As I thought about what I might say, I reflected on the very first public address I gave here in Ontario a number of years ago.

I was asked to share my thoughts on what causes mega projects to fail, or conversely, what are the keys to success.

I shared the eight keys to success on which I focus:

1. Exhaustive preparation
2. Clear scope definition
3. Completion of all engineering
4. Development of a detailed cost and schedule
5. Experienced and aligned leadership
6. Standard setting risk management
7. Effective and transparent oversight
8. Comprehensive “Lessons Learned” program

Well, we have indeed focused on these areas.... and 757 days ago workers from across this province donned their hard hats, grabbed their tools and started work on Canada’s largest clean energy project -- the Darlington Nuclear Refurbishment.

It was a long anticipated moment and the culmination of about 3,000 days of planning, training and practice.

We’re now well past the half-way mark on our Unit 2 refurbishment schedule.

In its simplest terms, the refurbishment of a CANDU unit involves the removal and replacement of the major reactor components.

Each unit can take just over three years to refurbish.

It is a massive undertaking, requiring dozens of trades, hundreds of separate projects, thousands of skilled workers, hundreds of thousands of discrete tasks, and millions of hours of field work.

And once it's complete, you begin work on the next unit.

We've now completed all the work necessary to take the Unit 2 reactor apart and have started rebuilding it with new and refurbished components.

Four hundred and eighty new calandria tubes have been installed – the first step to making the reactor whole again.

The tubes provide passage through the reactor's tank, or calandria vessel, and allow us to install the fuel channel assemblies.

The project team is also refurbishing the steam turbines.

For the first time in Darlington's history, the turbine spindles were removed and the blades inspected before carefully being hoisted back into place.

Next, we will begin installing the remainder of the fuel channel components, including end fittings, annulus spacers and pressure tubes.

We've also started planning our execution of Unit 3, incorporating the lessons learned from Unit 2, which is scheduled for completion in early 2020.

All four units will be refurbished by 2026.

Today, I'm very pleased to tell you the Darlington Refurbishment remains on time and on budget.

Most importantly, we recently reached the two-year milestone with a safety performance that is 10 times better than Ontario's industry average.

That's more than 11 million hours worked without a lost time injury, which is especially impressive since 13,000 people have worked on the project, many of whom are new.

I could end my update here but the Refurbishment story is much, much bigger.

It's a story of collaboration, innovation and partnership.

It's a story of people and companies from across this province pulling together for a greater purpose.

And it's the biggest *Made in Ontario* story of this century.

Executing on the eight points I outlined earlier are resulting in clear project successes, but we should not be satisfied with just project success, we need all of Ontario to feel that benefit and that means applying these three multipliers. So let me touch on each.

Collaboration

Collaboration has been the fulcrum of our success.

I was reminded of this the other day while having lunch at a local diner.

An elderly couple sat at the table next to me and ordered one hamburger, a small fries and a drink.

I watched as the gentleman carefully sliced the burger in half and neatly divided the fries into two small piles. He sipped the drink and then passed it to his wife. She took a sip and passed it back.

Naturally, this tugged at my heart so I offered to buy them another meal, but the man respectfully declined, saying they were used to sharing everything.

He then began to eat his food while his wife sat still, not eating.

As the elderly man finished his half of the burger and fries, his wife had still not started eating hers.

I couldn't take it anymore so I asked her why she wasn't eating.

The elderly lady looked up and politely said, pointing to her husband, "I'm waiting on the teeth."

And I thought to myself, that's just like Mike Renchek and me.

Mike was kind enough to give me the teeth for today's speech.

When you're responsible for delivering the two largest infrastructure projects in Canada, it's natural and necessary we would turn to each other.

Bruce Power and OPG understand we're being presented with a rare opportunity -- to demonstrate that massive nuclear projects can be delivered safely, on time and on budget in this province.

And, to some extent, we also understand the future of the Canadian nuclear industry hinges on these refurbishments being successful.

That's why we communicate regularly with each other to share best practices and discuss what's working and what's not.

Formalized with a Memorandum of Understanding in 2015, our ongoing collaboration has helped us identify efficiencies and innovations to lower costs for customers, reduce risks, and share important lessons learned.

It has also allowed us to leverage economies of scale. This includes aligning on parts supply, using the same vendors and optimizing tooling innovations.

Recently we collaborated to develop refined tooling for use in the Darlington Refurbishment that saved 22 days on the pressure tube removal segment for Unit 2.

Our organizations have also been heavily focused on efforts to build skilled trades capacity in nuclear, to ensure a steady supply of highly qualified workers will be available to complete the work.

We believe this spirit of collaboration between companies will be key to growing the nuclear industry both in Canada and around the world.

The working **arrangements between OPG and our vendors** also continue to reap benefits in the execution of the project, producing a positive impact on cost and schedule.

The high level of collaboration between OPG and CanAtom has been especially effective. One approach centres on the use of staff secondments from OPG to raise the effectiveness of the project's planning and execution organizations.

Seconded staff have augmented vendor expertise and capabilities where there are gaps. They are productive and capable from day one, know the team and OPG processes and they provide OPG with a better view of the project's progress.

The value of this collaborative approach was confirmed by one of the Refurbishment's external oversight groups who observed an immediate positive impact on performance. These lessons will help us to save time and costs as we refurbish the remaining units at Darlington.

Innovation

Mining the lessons from current and past refurbishments has also fuelled important innovations.

Perhaps the most impressive is the state-of-the-art, full-scale mock-up reactor we continue to use to test tools, trouble shoot solutions to problems, and to train our people before tackling the real thing.

With complex projects like a refurbishment, every second saved by performing a task efficiently and precisely is an advantage. It keeps you on schedule and it saves money.

The mock-up had paid for itself by the time we opened the breaker for Unit 2 and we continue to use it for each and every work series.

It's also the star educational attraction at our open house event which last month welcomed another 3000 visitors.

American architect and inventor Bucky Fuller used to say: "I look for what needs to be done. After all, that's how the universe designs itself."

I admire this philosophy and it's what I appreciate about the nuclear industry.

Our manufacturers and supply partners are always exploring new innovations and work methods to increase productivity, safety as well as quality.

One of the refurbishment teams recently developed a way to **weld Inconel 690 (alloy)** elements to stainless steel adaptors and carbon steel pipe to address stress corrosion.

The team, including Laker Energy Products Ltd. and BWXT, consulted, brainstormed, tested, and carried out numerous problem-solving exercises until they figured it out.

The resulting innovation provides added assurance for the safe, reliable operation of our units, will assist with asset aging management in the future, and ultimately, will reduce costs.

It's also a 'CANDU first' that will benefit upcoming planned refurbishments around the world.

Partnerships

If collaboration is our fulcrum, partnerships are the Refurbishment's driving force.

More than 200 companies and organizations from across Ontario are involved in providing services, expertise, materials, and human resource programs.

In January, OPG initiated ION -- the Indigenous Opportunities in Nuclear program, which seeks to increase the number of Indigenous workers in the nuclear industry through apprenticeships and other job vacancies as they become available.

Working with **Kagita Mikam Aboriginal Training and Employment**, ION recruits qualified workers from Indigenous communities.

Recruits are placed in career-building jobs at OPG, our vendor organizations or in union halls, providing valuable experiences and transferable skills.

Through ION, we aim to increase the number of nuclear jobs held by Indigenous people to 2.4 per cent, up from 1.4 per cent currently.

The benefits of this partnership will be long-lasting for all involved.

And the same is true for many of our partner companies.

With more than 96 cents of every refurbishment dollar spent here in Ontario, our suppliers are delivering precision, high-quality parts on time and on budget, while investing in their own businesses and communities.

Nu-Tech Precision Metals, a metal extrusion company located in Arnprior, recently completed production of all 480 pressure tubes for Unit 3 and has already shipped them to Darlington.

Since 1957, every pressure tube in an operating CANDU reactor world-wide has been made by Nu-Tech. They doubled their number of employees to 70 plus and increased their footprint from 20,000 square feet to more than 250,000.

Their success supplying pressure tubes cultivated new opportunities. Nu-tech has leveraged their equipment and expertise and is now supplying titanium piping for seawater desalination, nickel copper piping for submarines, and titanium for aircraft like the Boeing 787 and the V22 Osprey.

In the last two years, **Brotech**, a precision machining company in Barrie, has doubled its size, going from 25 to 50 employees, most of whom are machinists specializing in precision machining for the nuclear, aerospace and defence industries.

And just this year, Brotech made a \$1 million building and equipment investment to meet the Darlington Refurbishment's needs.

One of the reasons for Brotech's success is its long-standing partnerships with Georgian College and the Ontario Youth Apprenticeship Program. Brotech ends up employing one or two students from each program per year.

Laker Energy Products, based in Oakville, supplies key CANDU reactor components including end fittings, liners, channel closures, and feeder materials.

In 2015, Laker purchased and moved to its current manufacturing plant as a direct result of its planned work to support the Refurbishment project.

Their new 66,000 square foot facility allowed Laker to triple its machining capacity and more than double its employees to over 90 – most of which are highly-skilled technical staff, experienced machinists, welders, engineers, and engineering technologists.

And there's E.S. Fox in Niagara Falls....

AeroTek Manufacturing in Whitby....

Curtiss-Wright in Newmarket....

Schomberg-based B.C. Instruments....

All companies and communities that have benefited from the Darlington Refurbishment.

Made in Ontario

For nearly 30 years, Darlington has been an important source of clean, safe, low-cost, reliable baseload power for Ontario.

The Conference Board of Canada estimates the 10-year, \$12.8 billion-refurbishment will grow Ontario's GDP by a total of **\$90 billion**, when you include 30 more years of station operations.

And at a long run average cost of 8¢/kWh in 2015 dollars – well below the cost of power from other generators except for legacy hydroelectric stations.

A refurbished Darlington will also reduce Ontario's carbon emissions by an estimated **297 million tonnes** or the equivalent of removing 2 million cars a year from our roads.

These are immensely positive and lasting impacts for the economy and environment.

Because above all else, refurbishing Darlington Nuclear is about the future of this province.

It's an investment in Ontario.

In clean air, a healthy climate, in jobs, in innovation, and in lower energy prices.

Closing

As we work on Unit 2 and look ahead to Unit 3, we will continue to set the standard for mega-project execution that others in the industry will strive to emulate.

This standard includes exhaustive preparation, clear definition and understanding of scope, a comprehensive, detailed cost and schedule, and a robust oversight program that ensures problems are identified and resolved quickly.

We will apply the same thoughtful planning, thinking and detailed work on all subsequent units as we have done successfully with Unit 2.

This includes applying the hard-fought lessons that we, along with our suppliers and contractors, have learned from the challenges to-date.

Lessons that will improve our safety, quality, schedule and cost performance even more for Unit 3.

Lessons that are already being applied to Bruce Power's major component replacement program, creating a constant loop of information sharing, collaboration, innovation and real-time improvements.

I want to thank the many thousands of trades and union members from across the province, our own OPG employees and leadership team, as well as our key project partners and the many companies that have contributed to the Refurbishment's success thus far.

We're very fortunate in Ontario to enjoy good public support for nuclear power.

It's a privilege to be a part of this project.

Every one of us understands this. We also understand that we must earn the public's trust day in and day out.

Delivering our refurbishment projects on time and on budget is the best way we can show that we care about the customer.

And I know I speak on behalf of all of our partners and collaborators when I say that we are up for this challenge and ready to deliver on our commitment to customers, and current and future generations of Ontarians.

Thank you. I'm happy to take any questions.